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Claims

[c1] A method comprising:
depositing on a surface of a substrate a layer formed of a material comprising carbon, hydrogen and at least one element selected from the group consisting of Si, Ge, B, Sn, Fe and Ti; and
annealing said layer in an environment comprising at least one of hydrogen and deuterium, thereby forming an annealed layer.

[c2] The method of Claim 1, wherein said material further comprises at least one element selected from the group consisting of O, N, S and F.

[c3] The method of Claim 1, wherein said material further comprises deuterium.

[c4] The method of Claim 1, wherein said layer is deposited by a plasma enhanced chemical vapor deposition (PECVD) process.

[c5] The method of Claim 4, wherein said PECVD process is performed in a parallel plate reactor wherein said substrate is placed on an electrode of the reactor.

[c6] The method of Claim 2, wherein said material comprises carbon in an amount of about 0.5 to 95 atomic %, hydrogen in an amount of about 0.5 to 50 atomic %, at least one element selected from the group consisting of Si, Ge, B, Sn, Fe and Ti in an amount of about 0.5 to 95 atomic %, and at least one element selected from the group consisting of O, N, S and F in an amount of about 0.5 to 70 atomic %.

[c7] The method of Claim 2, wherein said material comprises carbon in an amount of about 1 to 60 atomic %, hydrogen in an amount of about 1 to 40 atomic %, at least one element selected from the group consisting of Si, Ge, B, Sn, Fe and Ti in an amount of about 1 to 60 atomic %, and at least one element selected from the group consisting of O, N, S and F in an amount of about 1 to 40 atomic %.

[c8] The method of Claim 2, wherein said material comprises carbon in an amount of about 5 to 50 atomic %, hydrogen in an amount of about 5 to 30 atomic %, at least one element selected from the group consisting of Si, Ge, B, Sn, Fe and Ti in an amount of about 5 to 50 atomic %, and at least one element selected from the group consisting of O, N, S and F in an amount of about 5 to 30 atomic %.

[c9] The method of Claim 1, wherein said annealing environment contains at least one of hydrogen and deuterium in an amount of about 0.1 to 100 %.

[c10] The method of Claim 1, wherein said annealing is performed at a temperature of about 350 °C to 500 °C and for a duration of about 1 min. to 100 min.

[c11] The method of Claim 1, wherein said annealing is performed at a temperature of about 380 °C to 450 °C and for a duration of about 10 min. to 60 min.

[c12] The method of Claim 1, wherein said annealing is performed at a temperature of about 400 °C to 425 °C and for a duration of about 30 min.

[c13] The method of Claim 1, wherein said depositing step is performed in a first chamber, and said annealing step is performed in a second chamber different from said first chamber.

[c14] The method of Claim 1, wherein said depositing step is performed in a chamber, and said annealing step is performed in the same chamber.

[c15] The method of Claim 1, wherein said layer is annealed in an environment comprising hydrogen, and said annealed layer comprises hydrogen in an amount of about 20 to

60 atomic %.

[c16] The method of Claim 1, wherein said layer is annealed in an environment comprising hydrogen, and said annealed layer comprises hydrogen in an amount of about 30 to 50 atomic %.

[c17] The method of Claim 1, wherein said layer is annealed in an environment comprising deuterium, and said annealed layer comprises deuterium in an amount of about 10 to 40 atomic %.

[c18] The method of Claim 1, wherein said layer is annealed in an environment comprising deuterium, and said annealed layer comprises deuterium in an amount of about 20 to 30 atomic %.

[c19] The method of Claim 1, wherein said annealed layer comprises at least one of hydrogen or deuterium in a concentration which is greater at an interface with said substrate than at other portions of the layer.

[c20] A method comprising:
depositing on a surface of a substrate a layer formed of a material comprising carbon, deuterium and at least one element selected from the group consisting of Si, Ge, B, Sn, Fe and Ti; and
annealing said layer in an environment comprising at

least one of hydrogen and deuterium, thereby forming an annealed layer.

[c21] A lithographic structure comprising a plurality of layers, at least one layer being formed of a material comprising carbon, deuterium, and at least one element selected from the group consisting of Si, Ge, B, Sn, Fe and Ti.

[c22] The lithographic structure of Claim 1, wherein said material further comprises at least one element selected from the group consisting of O, N, S and F.

[c23] The lithographic structure of Claim 1, wherein said material further comprises hydrogen.